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1. Introduction

1.1 The Shearwater 2000 Hunter V2 is an equipment designed to detect, locate, and identify Radio transmitters used for surreptitious surveillance (Radio Microphones). Hunter V2 is designed to detect virtually all known, or theoretically possible, Radio Microphone attacks, with an ease of use previously impossible.

1.2 Hunter V2 is capable of extremely high degrees of effectiveness when used by seasoned professionals, or by casual staff after a few hours of training.

2. System Description

2.1 Hunter V2 is a Differential Field Gradient Radio Microphone Detector. The system works by detecting the rapidly changing Electromagnetic field created by an adjacent Radio microphone, while rejecting the strong but essentially constant Electromagnetic fields due to distant but powerful broadcast transmitters.

2.2 The system has the following parts:

1 x Search Head
1 x Signal Processor/ Extendable boom assembly
1 x Headset
1 x Audio Cassette Training Aid
1 x Test Source / Training aid
1 x User Manual
1 x Transit Case

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3. System Capabilities

3.1 Hunter V2 is designed to be effective against virtually all known or possible types of Radio Microphone. The system is unique in that while capable of detecting the most sophisticated types of attack, Hunter V2 can be used effectively by an average person after rudimentary instruction. The following types of device are detectable by Hunter V2, together with the sounds expected in the headset:

Radio Microphone Type	Notes	Expected Audio from Headset
Frequency Modulated (F.M.)	Simplest and most common type	Room noises, same as the microphone detects
Amplitude Modulated (A.M.)	Little used because F.M. offers better quality	Room noises, same as the microphone detects
Double Modulated (Sub-Carrier)	In common use for 25 years	Silence. Headset will go quiet. Tapping the suspected Radio microphone may cause corresponding sounds in the Hunter V2 headset.
Double Modulated/Noise masking	Similar to Double Modulated, but with masking added to make the detected quiet carrier less notable	May hiss, may hum, or may sound like anything, but only at one location in the room. Tapping suspected microphone may cause corresponding sounds in headset.
Delta Modulated, including CVSD.	Simplest approach to digital communication	Sounds like noise, but containing the cadence of room noises.
PCM (Pulse Coded Modulation), including ADPCM	More sophisticated digital communication	Often sounds like noise. Often contains the cadence of room noises, but not always. Sometimes silent.
Noise Modulated (DSSS)	Spread Spectrum	White Noise, no cadence.
FM Frequency Hopper	Spread Spectrum	Room Noises
Digital Hopper	Spread Spectrum	Sounds like noise, but containing the cadence of room noises.
Inverted Speech FM, Time Domain Interleaving, including split band inversion	Elementary method of "Scrambling" speech to conceal the true nature of the signal. Quite popular.	The cadence of room noises will be heard. Tapping the suspected microphone will cause very marked sounds.

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Digitally Encrypted	High security transmission. Available, but not common.	Noise will be heard, no cadence
Burst Mode	Signals stored in Radio Microphone memory and transmitted in rapid bursts. Not in common use.	Rapid deflection of metering, occurring occasionally. Pulses heard in headset. Very hard to locate dependant of how often the bursts a transmitted.
Single Side Band (SSB)	Not common because of difficulties in achieving good sound quality	Signal is only present when noise is present in Target location. Tapping suspected microphone will cause cadence to be detected in the headset
Data Attacks	Not all Radio eavesdroppers use microphones - computer data is just as valuable	Bursts of data corresponding to the operation of data Processing equipment should be suspect. Note that most electronic equipment radiates to some degree, so care in identification is necessary.
Others	**?**	As technology evolves, so does the eavesdropper. Be suspicious of any localised high strength Hunter V2 meter indication, irrespective of what it sounds like.

*Cadence This is the property whereby when the Radio Microphone detects a sound, the transmission from the microphone does not contain the sound in a form which is identifiable as the sound, but is still notable as a change in the transmission which is correlated to sounds in the search location. A example would be a hand clap which sounds on a CVSD transmission as a burst of noise. The noise is not recognizable as a clap but instantly recognizable as a change in transmission caused by the clap.

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4. Theory of Operation

4.1 The Hunter V2 is intended to be used both but Technical Security professionals during Technical Security Inspections, and by General Security or office staff, supplementing physical searches. This is possible because unlike most effective Technical Countermeasures equipment, Hunter V2 is easy to use, positive in operation, and it does not require years of skill and technical ability to interpret the results.

4.2 Hunter V2 is a Differential Field Gradient Radio Microphone detector. The Differential Field Gradient method of Radio Microphone detection works on the principle that the Radio signals from relatively distant sources generate a fairly constant Radio frequency field strength, while the signal from a very close transmitter (Radio microphone) shows a very marked change in field strength close to the device.

4.2 The search Head of Hunter V2 contains two balanced ultra wide band detectors , positioned side by side. The Hunter V2 functions by comparing the outputs from the two detectors on the Search Head. When the Search Head is detecting only innocent broadcast transmissions from distance sources, the output from each of the two Search Head detectors is equal, and Hunter V2 will give little or zero meter indication. When the Search Head is moved over a Radio Microphone, the Hunter V2 metering detects the imbalance providing indication on the LED metering, usually a full scale deflection.

4.3 Hunter V2 is equipped with a Centre Zero Light Emitting Diode (LED) meter. Full scale deflections left and right correspond to the movement of the head over the object generating the high local field (Radio microphone). When the field is stronger to the left of the search head, meter deflection is to the left.

4.4 Hunter V2 is equipped with an audio demodulation system enabling the nature of the transmission detected to be ascertained.

4.5 Hunter V2 looks like a metal detector, and is used the same way. The system search head is a lightweight antenna system which is connected by a shaft to the signal processor.

4.5 The user connects to search head to the signal processor shaft, plugs in the headset, switches on and commences use. The differential detection system means that typically no activity is noted on the LED meter until a severe R.F. field imbalance is noted. Power conduits and metal window frames will typically cause a small indication, an adjacent Radio Microphone will cause a large indication, typically full scale deflection, swinging from right to left as the search head is moved over the Radio Microphone. The recovered audio in the user headset

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clearly indicates if the signal causing the R.F. field disturbance is Broadcast Television, Broadcast A.M. or F.M., or something more sinister.

4.6 The Hunter V2 will find virtually all Radio Microphones, irrespective of sophistication. Not all Radio Microphone signals can be demodulated by Hunter V2, as modern technology allows digital encryption which effectively masks the nature of the signal to all except those with the appropriate decryption "Key". Hunter V2 will easily find and identify even the most sophisticated encryption technique by the simple fact that the signal is there, emanating from one spot.

Note: Standing waves from broadcast transmitters can cause a full scale deflection of the Hunter V2 metering in urban locations. These standing waves are usually notable at similar strength at a number of points in the sweep location. A full scale deflection, even if silent, noted adjacent to an object or part of a wall, at signal strength higher than is noted elsewhere in the sweep location, is almost certainly a Radio Microphone, especially if the deflection is still full with the gain reduced by rotation of the NORMAL/LOCATE control.

4.7 Normally, Hunter V2 will encounter innocent ambient signals when conducting an eavesdropper search. Hunter V2 is provided with a cassette tape which allows the user to become familiar with these sounds, and it is recommended that the user has listened to this tape, and is familiar with these sounds, prior to using Hunter V2. Innocent ambient signals will normally be noted at several points in the search location, sometimes they will be large enough to cause a full scale indication on the Bargraph meter.

Note: This tape should not be listened to at the search location unless a closed back headset is used, Using a cassette player With the loudspeaker active will alert the listening post that Hunter V2 is about to be used.

Note: Sometimes when a Radio Microphone is detected, the headset will at first indicate increased levels of innocent ambient signals. As the Radio Microphone is approached, the true nature of the Raio Microphone signal will be recognizable.

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5. System Controls

5.1 Hunter V2 has the following controls and switches

a) VOL/ON/OFF. A rotary control, located on the base unit. Function self-explanatory.

b) SENSITIVITY NORMAL//HUNT/HOME. A rotary control with integral switch. This control reduces the gain of Hunter V2 to allow the pin-pointing of powerful Radio Microphones, when discovered. The control is also useful when Hunter V2 is used in an extremely high ambient Radio Frequency environment. When the control is rotated from NORMAL, a flashing LED, labelled "Sense Low" informs the user that the system detection sensitivity is reduced.

c) SENSE LOW Indicator. Flashes yellow when the SENSITIVITY switch is in the reduced gain (HUNT - HOME) setting.

d) ON. A green indicator which illuminates when power is turned on.

e) LOW BAT. A flashing red indicator which illuminates when the batteries are almost exhausted.

f) PHONES. 1/4" Jack socket for connection to a stereo headset, 32 Ohm minimum impedance. A closed back headset is recommended to prevent sounds from the headset from being detected by the Radio Microphone.

g) SIGNAL STRENGTH. A centre zero LED Bargraph meter. When Hunter V2 is in a uniform Radio Frequency field, no indication on the meter is normal. If the field is stronger to the left hand side of the search head, the meter deflects to the left. If stronger to the right of the search head, the meter deflects to the right.

h) BALANCE (On Search Head). Used to set the FIELD STRENGTH meter to zero prior to starting work.

i) MODE SONAR/LISTEN. This switch changes the sound heard in the headset from detected audio from the radio transmission to a sonar style ping which increases in frequency when the FIELD STRENGTH meter deflects.

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6. Operation

Note: Before the operation, make sure the batteries are fully charged, or a spare set of batteries is available.

a) Assemble the Hunter V2 system, put on the headset, and turn on. Ensure sensitivity is set to "NORMAL", turn POWER to ON and adjust VOLUME to a comfortable level. MODE should be set to LISTEN.

Note: Putting the headset on before switching on prevents sound from the headset from reaching the eavesdropping microphone, which could alert the listening post.

b) Ensure meter reading is Zero when the search head is held in space away from all objects (Centre of the room is the best place). Adjust Search Head mounted BALANCE control if necessary until no LED's in the SIGNAL STRENGTH meter are illuminated.

c) Perform a sweep of the target location. The Search Head of Hunter V2 should be moved close to every object and surface of the test location, including the walls, floors and ceilings.

Note: As the Hunter V2 search head is moved around the search location, sounds will be heard in the headset, and occasionally, some of the meter bars will illuminate showing the presence of field imbalance. This is quite normal, and the signals causing the imbalance will normally be easily identifiable from the sound in the headset. Should a Radio Microphone be encountered, the meter bars will deflect to full scale, and will go from full scale left to full scale right as the search head is moved by the Radio Microphone, and at the same time, the sound in the headset will change, indicating the presence of another type of transmission at this location. Do not forget the ceilings and floors, desks, and window frames.

d) Depending on the skill of the user, it is possible to perform a sweep with Hunter V2 which does not in any way alert the listening post that their Radio Microphone has been compromised. It is up to the user to decide whether to remove the device or not, but it is suggested that if the Radio Microphone has been banged by the Search Head, or if the user has been very close to the device when performing the search (the user's normal breathing sounds like thunder to the listening post in this situation) that the Radio Microphone is removed immediately.

Unless you are certain that the Radio Microphone user could not be aware that his attack has been discovered, Remove it or Loose it!

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7. Inspection guidelines

7.1 Radio microphones can be built into *anything*.

7.2 Radio Microphones can sound like *anything*.

7.3 Use both the LED metering and headset with MODE set to LISTEN. The LED meter will show you that a signal is present, the headset will tell you what it is, or is not.

7.4 Use at maximum sensitivity unless the ambient field is so high that full scale meter deflection occurs frequently due to broadcast transmissions.

7.5 Hunter V2 search head must be close to all surfaces and items in the sweep location. Use it like a vacuum cleaner and clear the floors, walls, ceilings, Get within 10 cm of everything.

8. Routine Maintenance and Adjustments

8.1 The Hunter V2 counter-surveillance equipment requires no routine maintenance. Should any defect be noted, the equipment should be returned to Shearwater 2000 or a locally appointed maintenance facility of Shearwater 2000 for repair.

9. Policy of Continual Improvement

9.1 Shearwater 2000 reserve the right to upgrade, improve, and modify our product line in keeping with our policy of providing our customers with the best tools possible to perform their work.

9.2 In order to provide leading edge equipment which satisfies customer needs, we appreciate feedback about our products, and through requests for changes can create better equipment more closely suited to your requirements. Your needs are our next product!

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